# Profile of Biology Literacy In The High School Student's Of West Lombok Regency

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**Abstract:** *The result of PISA measurement since 2000-2015 shows the fact that the students in Indonesia have low ability in science literacy. This research is aimed to know the level of biology literacy ability in the students of MIPA Program in High School in West Lombok regency basedon the school zone, school location, grade of class and gender . This research uses descriptive qualitative method. Samples of 360 students of class XI and XII MIPA in 6 SMA Negeri in West Lombok regency in 2017/2018 learning year. Research instruments using adaptation of PISA Science Literacy test in 2006 and 2009 and measured according to PISA level ability of science literacy. The results showed that the ability of the Biology Literacy of high school students in West Lombok regency based on school zone, school location, grade of class and gender difference is very varied .*
*.**Keywords**: Biology literacy, level of literacy*

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## I. Introduction

Good education becomes an investment and a means to print quality human resources and is one of the priorities in development in the era of globalization. According to [5]the National Education Standards Agency (2010), in order to be able to compete in the global community, every nation should not only master the development of science and technology, but also have sufficient mastery of science, social and humanities and its development. So to respond to the challenges of life in this age, then education should be relevant to encourage individuals to science and technology literacy. This is in line with the opinion of [15]Suciati et al (2014) stating that, "one of the keys to successfully challenging the 21st century is" literacy. " Individuals who are literate in science are expected to use their scientific information to solve problems in everyday life and produce useful scientific products.

According to [4]Jufri (2017: 124), "Biology subjects in high school are aimed at: 1) establishing knowledge schemes of students in the form of factual, conceptual, and procedural knowledge, and metacognitive in concrete and abstract realms, 2) improving science and technology applications which is beneficial for individuals, communities and the environment and realizes the importance of managing and conserving the environment for the welfare of society, and 3) growing the hard skill and soft skills in Biology in a balanced way to equip students with collaborative, communicative, creative and innovative skills and media literacy (media literacy) ... "So, the goal of learning Biology is ideally not just a transfer of knowledge (cognitive), skill (psychomotor) and attitude (affective) solely but related to the application in daily life of students in the context of science, environment, technology, and society so that the mastery of Biological concepts further la gi will play a role in spiritual and social construction.

In fact, the mastery of science by students in general and Biology in particular, has not been matched by its application in everyday life. Most students still consider that Biology lesson is a rote lesson dominated by foreign names and terms (Latin) that are difficult to pronounce and remember so as to influence learning outcomes to be less meaningful. According to [13]Rakhmawan et al (2012) the level of meaningfulness optimal in science learning for students can be obtained if students have good literacy skills science. That is, the learning activities of science is good or meaningful, ideally not only oriented to the knowledge (cognitive) but also must pay attention to the process of learning and effort implementation (implementation) knowledge in real life. Based on the results of the PISA assessment in 2000 given to 15-year-old students, the literacy ability of Indonesian students is low, as seen from the average science literacy test score of 393 from the standard 500 score score and ranked Indonesia 38th 41 participating countries. Similarly, the PISA test result in 2003 puts Indonesian students on the same rank with a score of 395.

The result of [6]PISA study in 2006 shows that the level of science literacy of Indonesian students has not shown better development because it is still in the average score range 393 with rank 50 of 57 countries.

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Even the [7]PISA 2009 result puts Indonesia at 57th place from 65 participating countries with decreasing score of 383, this score is also still below the standard standard from PISA that is score 500 (OECD, PISA 2009 Database).

In the [8]2012 PISA test report stated that the average score of Indonesian students' scores is 382, of which Indonesia is ranked 64 out of 65 participating countries, or ranked SEKOTONG from all PISA participating countries. While the final [9]PISA test results of 2015 released on December 6, 2016 showed Indonesian students in the science field ranked 62 of 72 participating countries with a score of 403. Despite the increase in score, the results are still below the OECD standard (average score 500). Based on this fact of course required a more planned follow-up and consistent both by the government and the world of education as a whole for the improvement of students' skills are more significant.In general, the achievement data of Science Literacy of Indonesian students is presented in the following table.

**Table no 1.** Literacy Achievement Data of Indonesian Students Based on PISA Assessment

| Year | PISA Average Score | Acquisition scores | Rating Indonesia | Amount of the State participant |
|------|-------|-----|-----|-----|
| 2000 | 500 | 393 | 38 | 41 |
| 2003 | 500 | 395 | 38 | 42 |
| 2006 | 500 | 393 | 50 | 57 |
| 2009 | 500 | 383 | 60 | 65 |
| 2012 | 500 | 382 | 64 | 65 |
| 2015 | 500 | 403 | 62 | 72 |

Several domestic studies on Indonesian science literacy skills show results that are not much different from PISA test results. The results of [12]Suciati et al (2014) study in 189 subjects in 7 SMA in Central Java Province showed that the average percentage of students' ability in Biology study was viewed from the low science literacy aspect ie content aspect (34.4%), process aspect (32, 61%), and the context aspect (35.91%). Furthermore, [3]Diana et al (2015) research shows the ability of science literacy ability of class X students at SMAN 12 Bandung TP 2014/2015 by using SLA instrument (Scientific Literacy Assessment) from cognitive realm average including less once with score 52,6, while from sphere affective averages include enough with a score of 62.5. The science literacy aspect of the lowest cognitive domain of the students is thinking and working scientifically with a score of 37.0, while the science literacy aspect that is the highest in students is science and society with score 64,5. The science literacy aspect of the affective domain that is the least controlled by the students is self efficacy with the score 52.1, while the science literacy aspect which is the highest of students is science value with score 68,5.

## II.  Material And Methods

This research uses descriptive method with research subjects amounting to 360 of the 2,357 student population of class XI and XII MIPA  (Science and Mathematic ) program. . Determination of sample size was taken using [1]Slovin formula :

$$n = \frac{N}{1 + N.e^2}$$

Information :
 n  = sample size
 N  = population size
    e  = % non-tolerable intake of samples ( *error tolerance* )

Sampling using *purposive* technique and *cluster random sampling* by using a Two Stage Process as follows:
1. Phase I; determined 6 high school that will be the place of research
2. Stage II; taken each proportionally 1 class of students of class XI and XII MIPA program year of learning 2017/2018 in selected schools.

Research sites on 6 schools from 15 SMA Negeri in West Lombok regency on years of learning 2017/2018 which is divided into 3 zones namely 1) South zone; SMAN 1 Sekotong, SMAN 1 Lembar, 2) Middle zone of SMAN 1 Gerung, SMAN Kuripan, and 3) North zone; SMAN Gunung Sari and SMAN 1 Narmada with sample distribution of 60 students each.

Instruments in this study using PISA tests in 2006 and 2009 that have been translated by [11]Puspendik 2014 and selected items that are relevant to the subject of Biology. This test also has re adapted by researchers as well as tailored to the topics of Biology learning in class X.

Aspects of this test are measured, among others; 1) aspects of *knowledge* consisting of scientific knowledge *(scientific inquiry)* and scientific explanation *,* and 2) the aspect of *competence* which consists of the ability to identify scientific issues *,* using scientific evidence and explaining scientific phenomena. Problem composition is presented in the following table :

**Table no 2**. Composition Problem on Biological Literacy Instruments

| Aspect | Component | Number of Problems | % | Problem Number |
|--------|-----------|--------------------|----|----------------|
| **Knowledge** | - Scientific knowledge ( *scientific inquiry* ) | 7 | 23 % | 3,4,7,11, 12,14,17 |
| | - Scientific explanation | 5 | 17 % | 8, 16, 18,19, 25 |
| **Competence** | - identifying scientific issues | 3 | 10% | 1,6,2 |
| | - using scientific evidence | 9 | 30 % | 5,13,20, 21, 23,27,28,29.30 |
| | - *explaining scientific phenomena* | 6 | 20 % | 9.10, 15, 22, 24,26 |
| | **amount** | **30** | **100%** | |

In addition, this instrument consists of 30 problems with mixed problem form of multiple choice, description and form Yes-No with a maximum score of 58. The score of acquisition is then converted with theLiteracy Capability level that has been determined with the description of each as presented in the following table:

**Table no 3 .** Science Literacy Ability Level

| Score Interval | LEVEL | DESCRIPTION |
|----------------|-------|-------------|
| ≤ 9.7 | Level 1 | unable to demonstrate even the most basic literacy of science |
| 9.7> R≥19.4 | Level 2 | students have the knowledge and ability to explain scientifically in a familiar context or make conclusions based on simple inquiry. They are only able to give a direct reason in making the interpretation of scientific findings |
| 19.4>R≥29,1 | Level 3 | students are able to identify scientific issues within context constraints. They can use their facts and knowledge to explain various phenomena and apply simple inquiry models or strategies |
| 29.1>R≥38,8 | Level 4 | students are able to work effectively in situations and issues related to explicit phenomena by utilizing the advancement of science and technology. They can select and combine explanations from different disciplines or technologies and relate them to various aspects of life situations |
| 38.8>R≥48,5 | Level 5 | students are able to identify scientific components in complex life situations, can apply various concepts and scientific knowledge to the situation and can compare, sort and evaluate various scientific evidence in response to life situations. At this level students have been able to develop their inquiring capabilities with good, associate knowledge and have a critical view on various situations. |
| 48.5> R≥58 | Level 6 | students have a consistent ability to identify, explain and apply scientific and other scientific knowledge to a variety of complex life situations. They can link different sources of information and explanations and use evidence from multiple sources to make decisions. Students at this level can use scientific knowledge and develop arguments to support personalized, social or global recommendations and decisions. |

## III. Result

Achievement of the ability of science literacy as a whole is obtained by counting the number of scores obtained by students who answer the questions correctly divided by the maximum score of the whole question. It then calculates the acquisition score interval to determine the level of biological literacy achieved by which it is divided into 6 levels.

Next, calculate the number of students according to agori scores acquisition and calculated the percentage of all samples. To obtain a more comprehensive picture of this Biological Literacy capability, the research data is classified according to the school zone, school location, grade of class and gender. Data research results on distributed as follows:

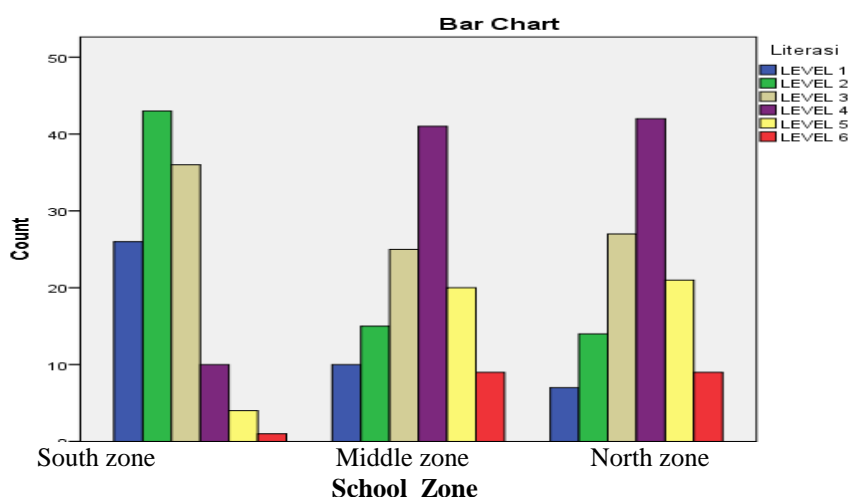## IV. The Ability Of Biology Literacy Based On Zone
**Table no 4** . The Ability of Biologiy Literacy Based on Zone

| Zone | School | Biological Literacy Level | | | | | | Total |
|------|--------|---|---|---|---|---|---|-------|
| | | **1** | **2** | **3** | **4** | **5** | **6** | |
| | SMAN 1 SEKOTONG | 15 | 28 | 13 | 3 | 1 | 0 | 60 |
| SOUTH | SMAN 1 LEMBAR | 11 | 5 | 23 | 7 | 3 | 1 | 60 |
| | amount | 26 | 43 | 36 | 10 | 4 | 1 | 120 |
| | Percentage | 7.2% | 11.9% | 10% | 2.8% | 1.1% | 0.3% | 33.3% |
| | SMAN 1 GERUNG | 0 | 4 | 10 | 24 | 15 | 7 | 60 |
| MIDDLE | SMAN 1 KURIPAN | 10 | 11 | 15 | 17 | 5 | 2 | 60 |
| | amount | 10 | 15 | 25 | 41 | 20 | 9 | 120 |
| | Percentage | 2.8% | 4.2% | 6.9% | 11.4% | 5.6% | 2.5% | 33.3% |
| | SMAN 1 NARMADA | 0 | 5 | 12 | 23 | 14 | 6 | 60 |
| NORTH | SMAN 1 GN . SARI | 7 | 9 | 15 | 19 | 7 | 3 | 60 |
| | amount | 7 | 14 | 27 | 42 | 21 | 9 | 120 |
| | Percentage | 5.8% | 3.9 % | 7.5% | 11.7% | 5.8% | 2.5% | 33.3% |

Based on the above table it appears that in the South zone the highest percentage of students' Biology Literacy ability .There are at level 2 (11 , 9 %) and level 3 (10%), meaning most of the students still have limited knowledge and ability and only can do scientific explanation in a familiar context or make inferences based on inquiry (that is simple . While the lowest percentage are at level 6 is 0, 3%.

In the Middlel and North zones, the highest percentage is seen at level 4 ,its about 11 , 4 % and 11.7%. This means that most of the students in this region have the ability to utilize the progress of science and technology in combining explanations from various disciplines of science or technology to a phenomenon and relating them to various aspects of life situations . Although the percentage of level 1 (2.8%) in the Central zone is smaller than the northern zone (5.8%) but at level 2, level 3 and level 5 North zone show better performance than students in the Middle zone. While at level 6 they demonstrate the same percentage of consistent ability to identify, explain and apply scientific and other scientific knowledge to a variety of more complex life situations. Especially the ability to developt arguments to support recommendations and decisions centered on personal, social or global situations.

So it can be said that students' Biology literacy skills in the South zone are dominated at levels 2 and 3 while in the Central and North zones are dominated at levels 3 and 4. Generally the Literacy skills of students in the Central and Northern zones are better than those in the South zone. More clearly visible on the graph presented below :
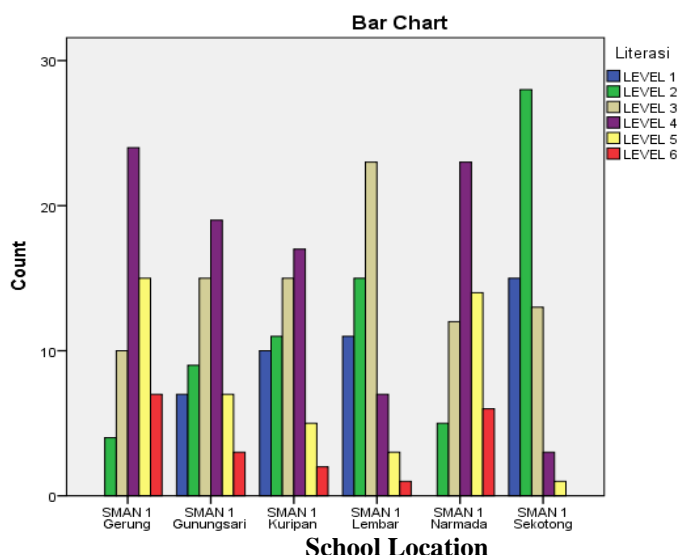


## V.  The Ability Of Biology  Literacy Based On School Location
**Table no 5** . The Ability of Biology Literacy Based on School Location

| School | Student Achievement Score | | | | | | Total |
|---|---|---|---|---|---|---|---|
| | R ≤ 9.7 (Level1) | 9.7 <R≤19,3 (Level 2) | 19.3 <R≤29 (Level 3) | 29 <R≤38,7 (Level 4) | 38.7 <R≤48.4 (Level 5) | 48.4 <R≤58 (Level 6) | |
| SMAN 1 Gerung | 0 | 4 | 10 | 24 | 15 | 7 | 60 |
| Percentage | 0% | 6.7% | 16.7% | 40% | 25% | 11.7% | 100% |
| SMAN 1 Gunung Sari | 7 | 9 | 15 | 19 | 7 | 3 | 60 |
| Percentage | 11.7% | 15% | 25% | 31.7% | 11.7% | 5% | 100% |
| SMAN 1Kuripan | 10 | 11 | 15 | 17 | 5 | 2 | 60 |
| Percentage | 16.7% | 18.3% | 25% | 28.3% | 8.3% | 3.3% | 100% |
| SMAN 1 Lembar | 11 | 15 | 23 | 7 | 3 | 1 | 60 |
| Percentage | 18.3% | 25% | 38.3% | 11.7% | 5% | 1.7% | 100% |
| SMAN 1Narmada | 0 | 5 | 12 | 23 | 14 | 6 | 60 |
| Percentage | 0% | 8.3% | 20% | 38.3% | 23.3% | 10% | 100% |
| SMAN 1Sekotong | 15 | 28 | 13 | 3 | 1 | 0 | 60 |
| Percentage | 25% | 46.7% | 21.7% | 5% | 1.7% | 0% | 100% |
| Total | 43 | 72 | 88 | 93 | 45 | 19 | 360 |
| Percentage | 11.9 % | 20 % | 24.4 % | 25.8 % | 12.5 % | 5.3 % | 100% |

From the data above it appears that the highest percentage for Level 1 and Level 2 is found in SMAN 1 Sekotong, 25% and 46,7%. While at Level 3 the highest percentage is 38 , 3 % is in SMAN 1 Lembar. While at Level 4, 5 and 6 the highest percentage is found in SMAN 1 Gerung that is 40%, 25% and 11,7% respectively although the average is only different 1,7% from SMAN 1 Narmada.
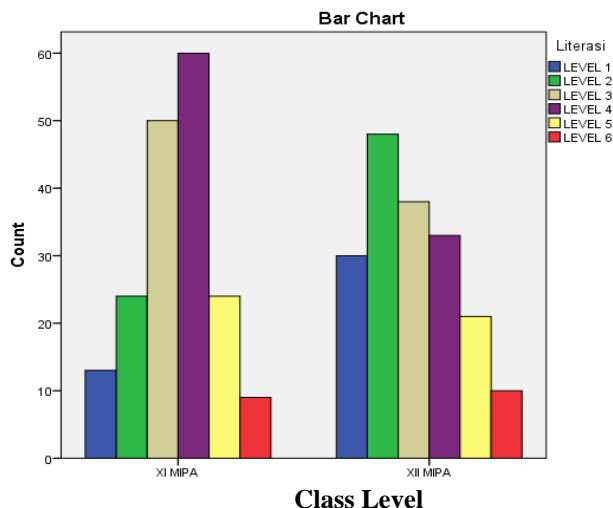
## VI. The Ability Of Biology Literacy Based On Grade Of Class
**Table no 6.** Ability of Biology Literacy Based on Grade of Class

| School | Class | Biological Literacy Level | | | | | | Amount |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | |
| SMAN I SEKOTONG | XI | 5 | 11 | 10 | 3 | 1 | 0 | 30 |
| | XII | 10 | 17 | 3 | 0 | 0 | 0 | 30 |
| SMAN 1 LEMBAR | XI | 3 | 3 | 15 | 5 | 3 | 1 | 30 |
| | XII | 8 | 12 | 8 | 2 | 0 | 0 | 30 |
| SMAN 1 GERUNG | XI | 0 | 2 | 4 | 19 | 3 | 2 | 30 |
| | XII | 0 | 2 | 6 | 5 | 12 | 5 | 30 |
| SMAN 1 KURIPAN | XI | 3 | 3 | 6 | 11 | 5 | 2 | 30 |
| | XII | 7 | 8 | 9 | 6 | 0 | 0 | 30 |
| SMAN 1 NARMADA | XI | 0 | 3 | 9 | 10 | 7 | 1 | 30 |
| | XII | 0 | 2 | 3 | 13 | 7 | 5 | 30 |
| SMAN 1 GN.SARI | XI | 2 | 2 | 6 | 12 | 5 | 3 | 30 |
| | XII | 5 | 7 | 9 | 7 | 2 | 0 | 30 |
| Total | XI | 13 | 24 | 50 | 60 | 24 | 9 | 180 |
| Percentage | | 7.2 % | 13.3 % | 27.8 % | 33.3 % | 13.3 % | 5 % | 100% |
| Total | XII | 30 | 48 | 38 | 33 | 21 | 10 | 180 |
| Percentage | | 16.7 % | 26.7 % | 21.1 % | 18.3 % | 11.7 % | 5.6 % | 100% |

From the data we can be seen that the highest percentage of ability in class XI is at Level 3, 4 and 5 that is 27.8%; 33.3% and 13.3% while in grade XII the higher percentage was found in Level 1, 2 and 6 respectively 16.7%; 26.7% and 5.6%. The following chart illustrates the variations in students' Biology Literacy abilities based on their grade:

# VII.     The Ability Of Biology  Literacy Based On Gender

**Table no 7**. The ability of Biology Literacy Based on Gender

| School | Class | Biological Literacy Level | | | | | | Amount |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | |
| SMAN          I SEKOTONG | L | 8 | 17 | 5 | 0 | 0 | 0 | 30 |
| | P | 7 | 11 | 8 | 3 | 1 | 0 | 30 |
| SMAN 1 LEMBAR | L | 4 | 9 | 13 | 3 | 1 | 0 | 30 |
| | P | 7 | 6 | 10 | 4 | 2 | 1 | 30 |
| SMAN 1 GERUNG | L | 0 | 2 | 6 | 13 | 6 | 3 | 30 |
| | P | 0 | 2 | 4 | 11 | 9 | 4 | 30 |
| SMAN         1 KURIPAN | L | 6 | 8 | 7 | 7 | 2 | 0 | 30 |
| | P | 4 | 3 | 8 | 10 | 3 | 2 | 30 |
| SMAN         1 NARMADA | L | 0 | 2 | 6 | 15 | 6 | 1 | 30 |
| | P | 0 | 3 | 6 | 8 | 8 | 5 | 30 |
| SMAN 1 GN.SARI | L | 3 | 4 | 11 | 8 | 3 | 1 | 30 |
| | P | 4 | 5 | 4 | 11 | 4 | 2 | 30 |
| Total | L | 21 | 42 | 48 | 46 | 18 | 5 | 180 |
| Percentage | | 11.7 % | 23.3 % | 26.7 % | 25.6 % | 10 % | 2.5 % | 50% |
| Total | P | 22 | 30 | 40 | 47 | 27 | 5 | 180 |
| Percentage | | 12.2% | 16.7 | 22.2% | 26.1% | 1 5% | 7.8 % | 50% |

From the data above, it is found that based on gender difference, male students have better percentage of Biology Literacy ability at Level 2 and 3 that is 23.3% and 26.7% while female students have higher percentage at Level 1 , 4, 5 and 6 ie 12.2%; 26.1%; 15% and 7.8% respectively. Variations in the ability of Literacy Biology of SMAN students in West Lombok regency based on gender are presented in the graph as follows:
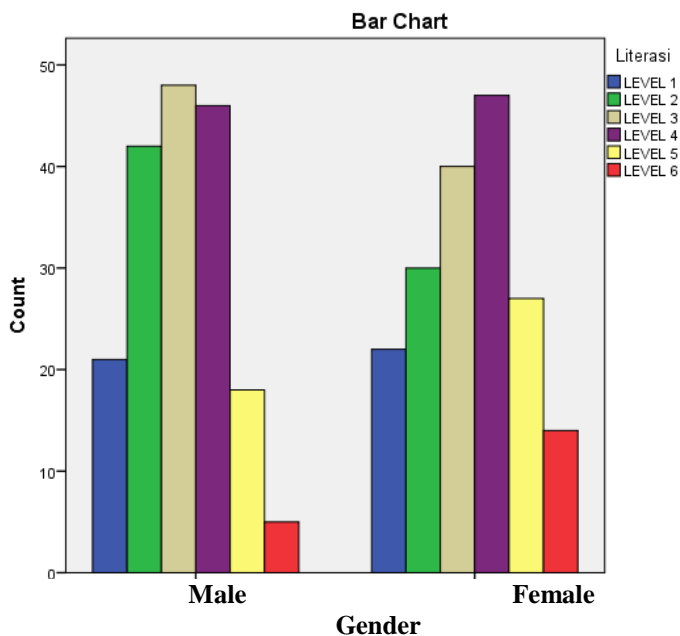


# VIII.    Discussion

Still a high percentage of Literations  Capacity of Biology at level 1 in all types of categories indicates that there are still many high school students in West Lombok Regency has only the most basic literacy skills. When compared with the structure of cognitive learning outcomes    according to [4]Krathwohl (in Jufri, 2017: 82) then level 1 is synonymous with the ability to remember *(remember)* where students can only develop relevant knowledge from long-term memory to be able  to recognize *(recognizing)* and recall or call back *(recalling)* . So in other words the students at this level only has to memorize to learning materials obtained from theachers  or from other sources.

As well as with the number which is quite a lot in the sample that shows the ability at level 2  have the knowledge and ability to explain scientifically in a familiar context or make conclusions based on simple inquiry . At this level, according to [4]Krathwohl characterized by the ability to understand *(understand)* in the form of a message determiner ability or learning content , either orally, in writing and communications in other forms (Jufri, 2017: 82). Whereas if it is contrasted with the cognitive learning

outcomes according to [3]Bloom then level 2 is a category of understanding ( *comprehension* ) expressed in terms of the ability to understand information, explain meaning, interpret facts and predict the knowledge to be utilized in other situations (Jufri, 2017: 77).

At level 3 of the samples showed the ability to identification scientific issues in a limited context. They can use facts and knowledge to explain various phenomena and apply the model based on simpleobservation . If we refer to Bloom and Krathwohl Theory then level 3 is the ability to apply ( *apply* or *application* ) that is the ability to use knowledge or abstraction in concrete situation or special situation or according to procedure in limited context and slightly different conditions .

According to category of learning result of [4]Bloom hence merging these three levels of learning outcomes (Level 1 , 2 and 3) fall into the category of low-order thinking skills ( LOTS ). When combined the percentage results in these three levels of research , 56.3 % of SMA Negeri students in West Lombok Regency have low the ability Biology Literacy .

At level 4 there are 93 people or 25,8 % of the total sample demonstrate the ability to work effectively in situations and issues related to explicit phenomena by utilizing the advancement of science and technology. They have the ability to select and combine explanations from different disciplines or technologies and then relate them to various aspects of life situations .

The percentage recorded at Level 5 is 12.5% of the total sample or 45 students were able to identify the scientific components of complex life situations, be able to apply various concepts and itsscientific knowledge on the situation and can compare, sort and evaluate the scientific evidence in response to life situations her .At this level students have been able to develop the ability to better inkuirinya,linking knowledge and have a critical look at various situations.

Level 6 is the highest level of Literacy Biology ability but is the lowest percentage obtained by sample that is 5.3 % means that few students have the ability consistently to identify, explain and apply scientific knowledge and knowledge of his other on a wide variety of more complex life situations.

These three levels (4 , 5 and 6) are high - level thinking skills or HOTS . This skill by [4]Johnson (in Jufri , 2017 : 57) is distinguished into critical thinking and creative thinking. Critical thinking is a well-organized mental process and plays a role in the process of making decisions to solve problems by conducting analysis and interpretation of data in scientific discovery activities. While thinking creatively is a thought process that generates original ideas, is constructive and emphasizes intuitive and rational aspects.

## IX. Conclusion

The results of this study indicate the ability of Literacy Biology students in SMA Negeri Lombok Barat by using adaptation PISA test 2006 and 2009 shows data that ; 1) based on the zone where the school is located the South zone has a lower Biological Literacy capability than the Central and Northern zones, 2) based on the location of the school, students at SMAN 1 Sekotong have the average percentage of Biology literacy ability is lower than the other 5 schools. Students at SMAN 1 Gerung and SMAN 1 Narmada demonstrate better literacy ability performance, 3) Based on grade level, students in grade XI show better percentage at level 3,4 and 5 while grade XII is higher at levels a and 2, and 4) Based on gender then male students have better percentage at level 2 and 3 while female students show a slightly better percentage at level 1, 4, 5 and 6.

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